

D y | 4
S y s t e m s
A FORCE COMPUTERS BUSINESS UNIT

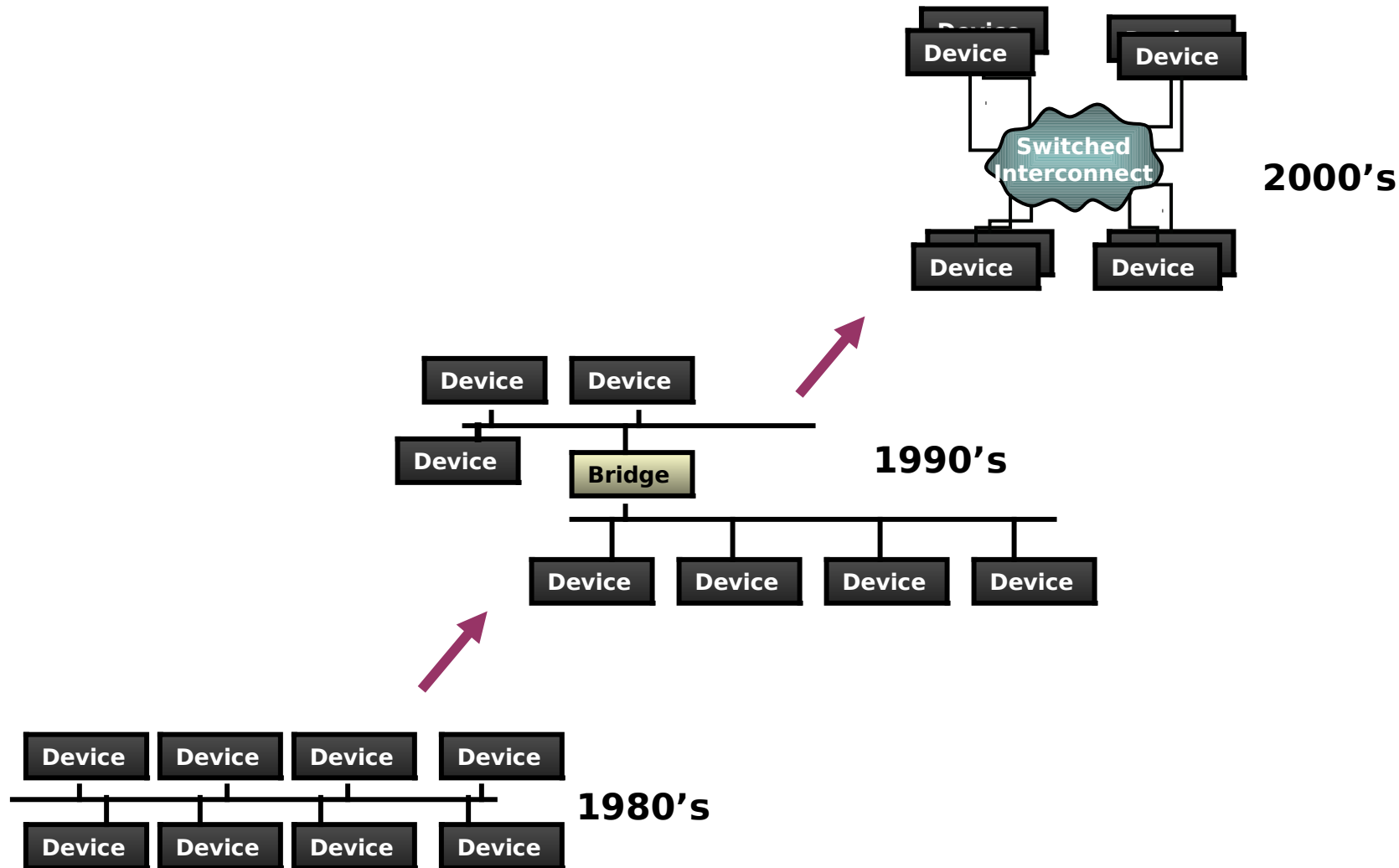
Architectural Freedom with Serial Interconnects

NDIA Conference
San Diego, CA
October 20-23, 2003

**Emmanuel Eriksson - Dy 4
Systems**
(emmanuel.eriksson@dy4.com)

Interconnect Trends

Bus vs. Switched



Shortcomings of Parallel Buses

Buses Don't:

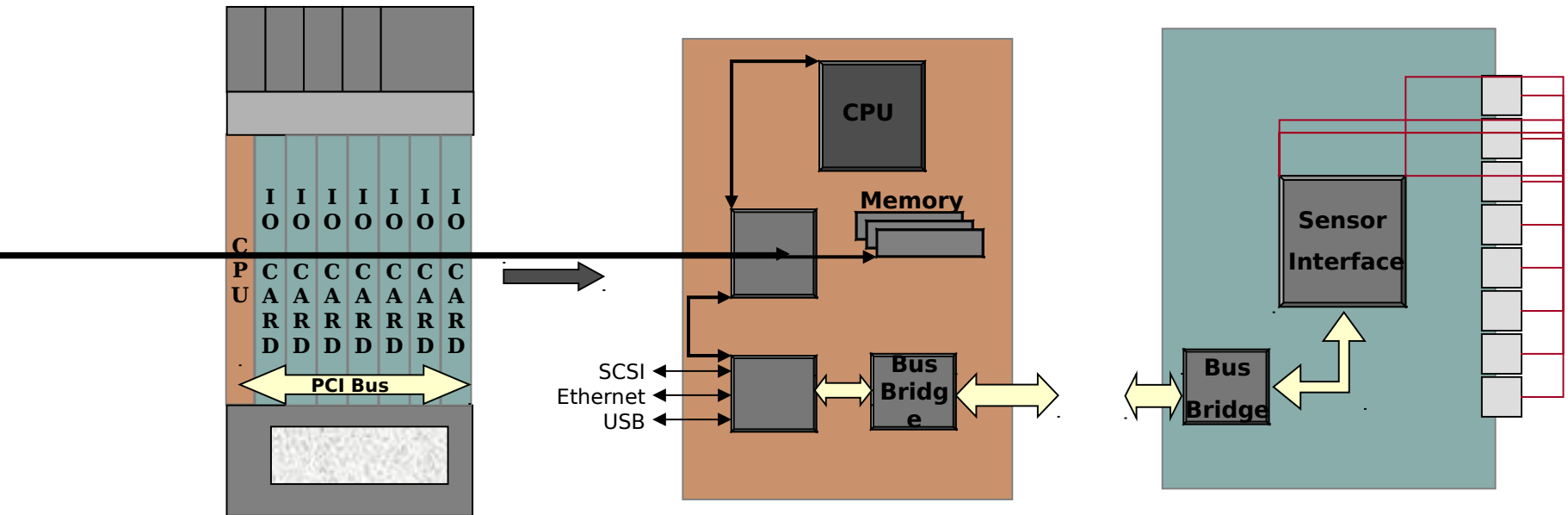
- **scale number of connections**
- **scale physically**
- **scale bandwidth**
- **support multiple traffic types**
- **support high availability**

You only need to encounter one limitation to make the move to a new architecture

Typical Embedded Distributed System Requirements

- **Large amount of data movement**
- **Large amount of data processing**
- **Large number of processing elements**
- **Often multiple processor types**
 - DSP, CPU and NPU
- **Wide range of I/O devices**
 - Sensors
 - Imaging and Video devices
 - Storage
 - Network Interfaces
 - Displays

Bus Based Architecture



- **Single address map**
- **Limited to a single processor or single bus owner at a time**
- **Difficulty scaling processing requirements with I/O needs**

LAN Based Architecture

- **Internet Protocol is a sophisticated protocol that is aimed at a complex problem:**
 - Interconnect hundreds of thousands of computers**
- Handle extreme latencies
- Handle lost packets
- Handle corrupted packets
- Handle out-of-order packet arrival

Limitations of Current Architectures

- **Difficulty balancing computational power with I/O requirements**
 - No support for **both** processor-to-processor and processor-to-device communication (Ethernet and bus architectures can do either but not both)
- **“Lossy” LAN transport do not meet lossless data collection requirements without additional software**
 - Ethernet will drop packets if congestion occurs
- **High latency or limited bandwidth scaling**
 - Moving a 64 bytes packet takes > 100 microseconds with Ethernet versus a couple of microseconds with a switch fabric
- **Limited Class of Service capability**
 - Ethernet has no separate queuing or buffering for CoS
 - Buses don't have any CoS

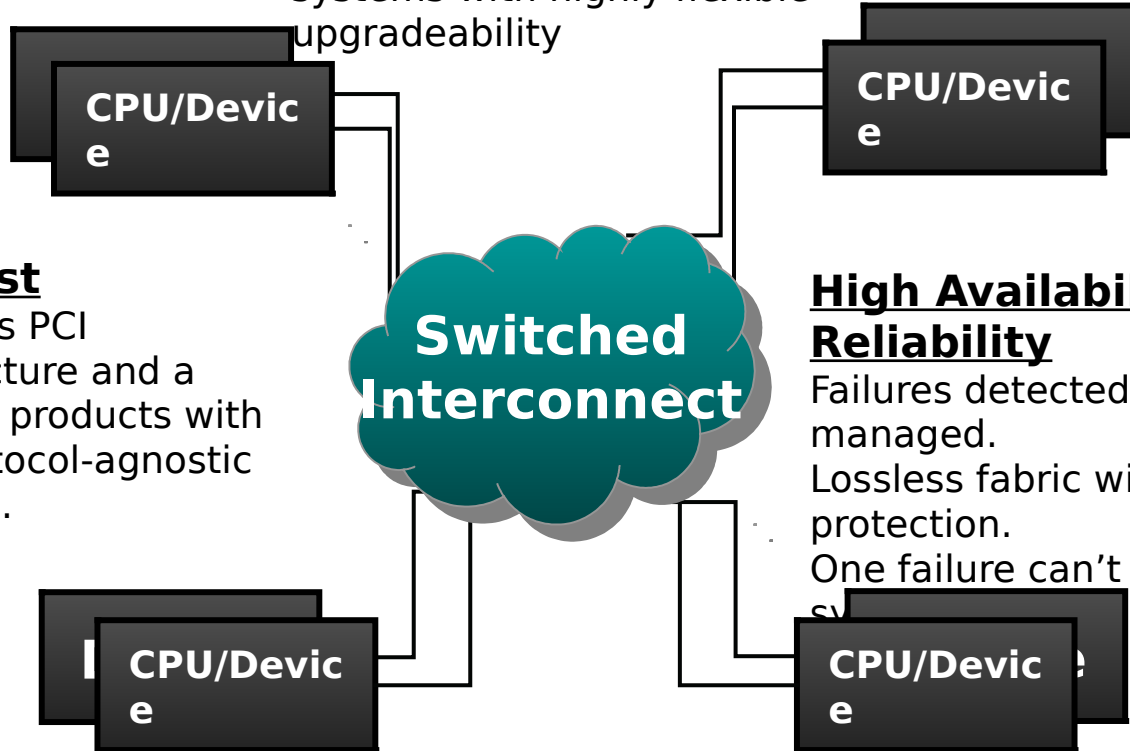
Serial Switched Interconnects

Scalability, Density, Flexibility Supports “disaggregated” and “virtual” systems with highly flexible upgradeability

Low Cost
Leverages PCI infrastructure and a wealth of products with lean, protocol-agnostic switching.

High Availability & Reliability
Failures detected, reported & managed.
Lossless fabric with CRC protection.
One failure can’t take down sv

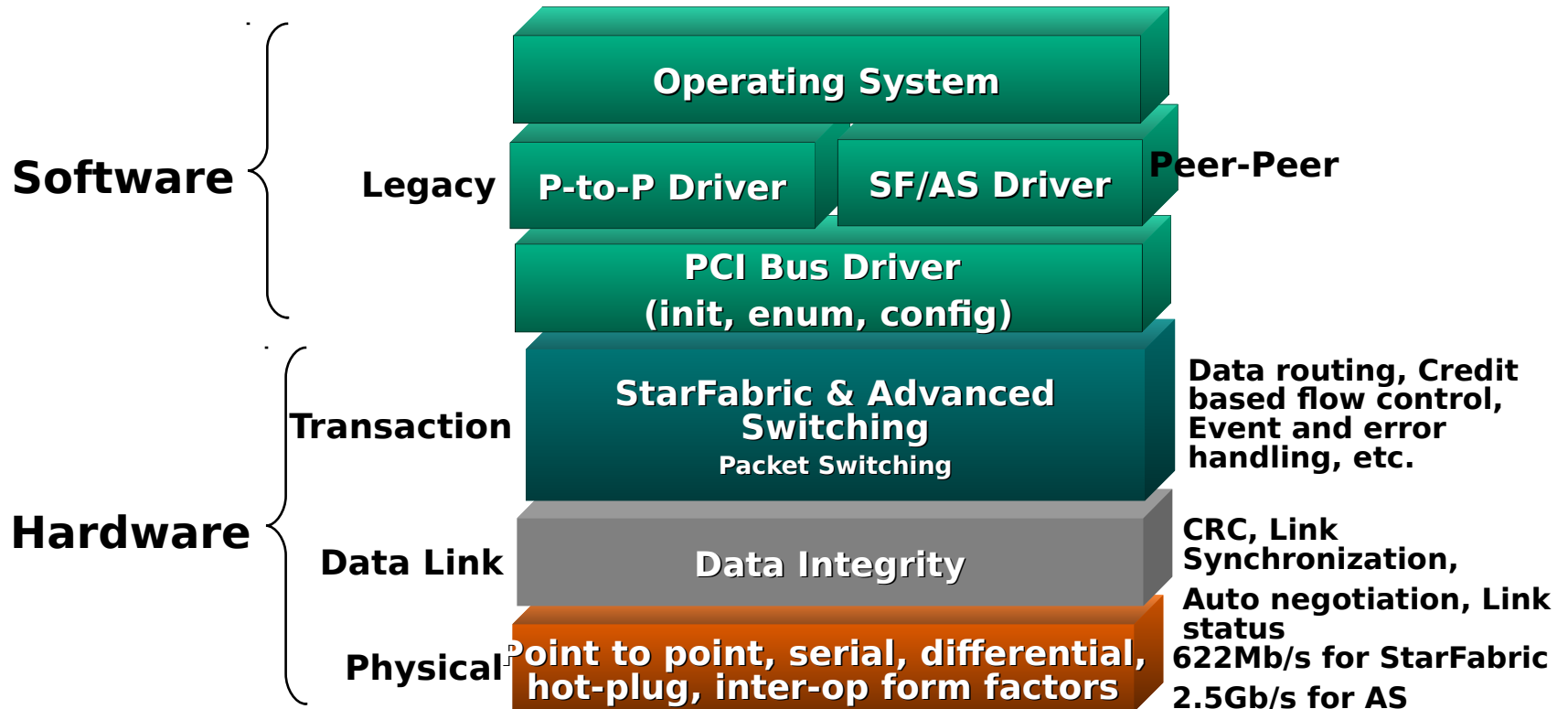
High Performance Unified Fabric Multiple types and classes of traffic supported on low latency, high bandwidth interconnect.



StarFabric & PCI Express Advanced Switching (AS)

- **Scalable, Extensible Serial Switched Interconnects**
 - Lean, High Performance, Low Cost Switching Architectures
 - Layered Approach Promotes Efficient Modularity
- **StarFabric**
 - Open standard switched interconnect (StarFabric Trade Association)
 - Based on 622Mb/s SERDES technology
 - 4X data bandwidth of 2 Gb/s
 - Links can extend beyond single chassis up to 10 meters through standard CAT5 cabling
 - In production since Spring 2002
- **PCI Express - Advanced Switching (AS)**
 - Based on the PCI Express™ architecture
 - Based on 2.5Gb/s SERDES technology
 - 4X data bandwidth of 8 Gb/s
 - Available in late 2004

Multi-Layered Protocols



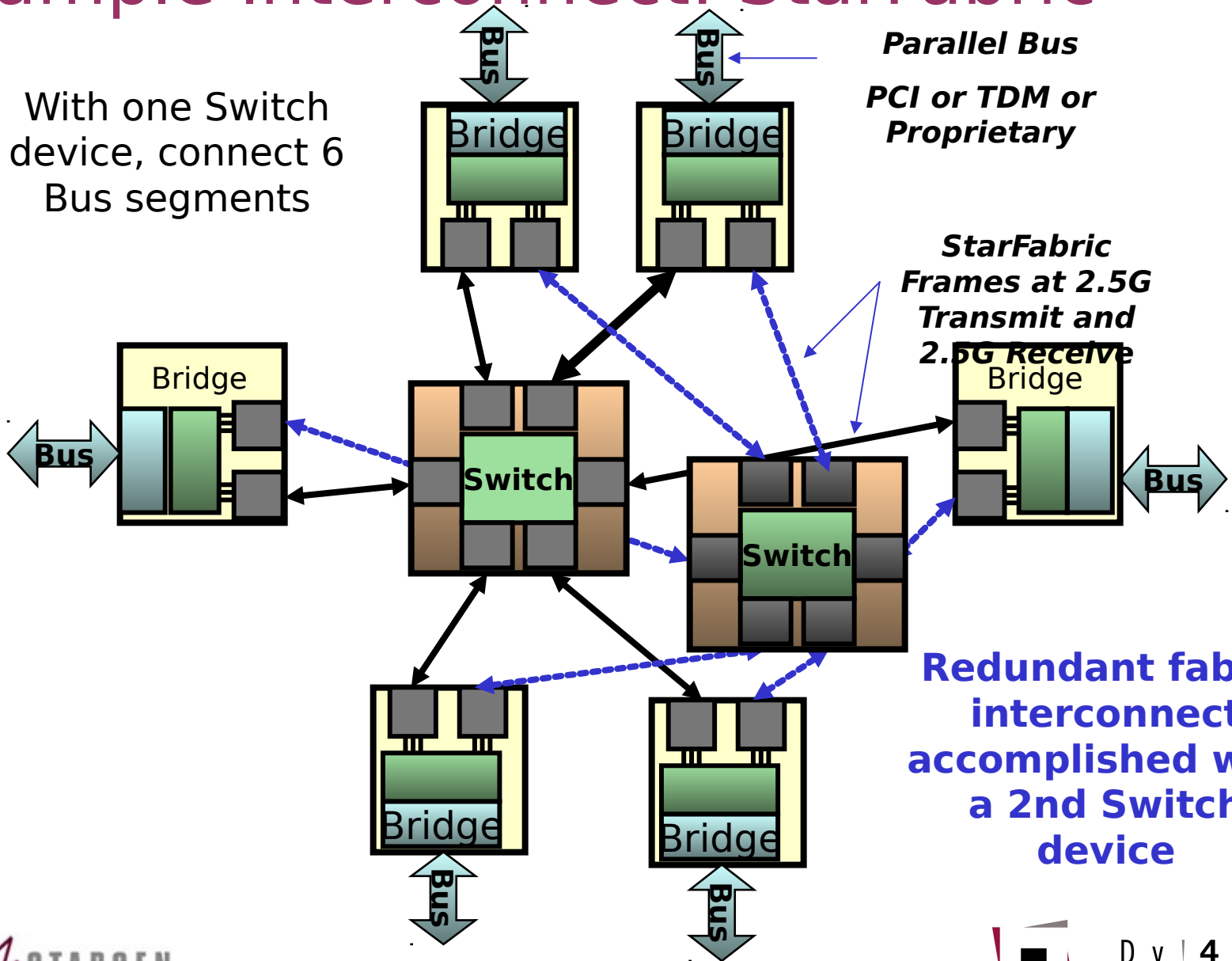
Example Interconnect: StarFabric

With one Switch device, connect 6 Bus segments

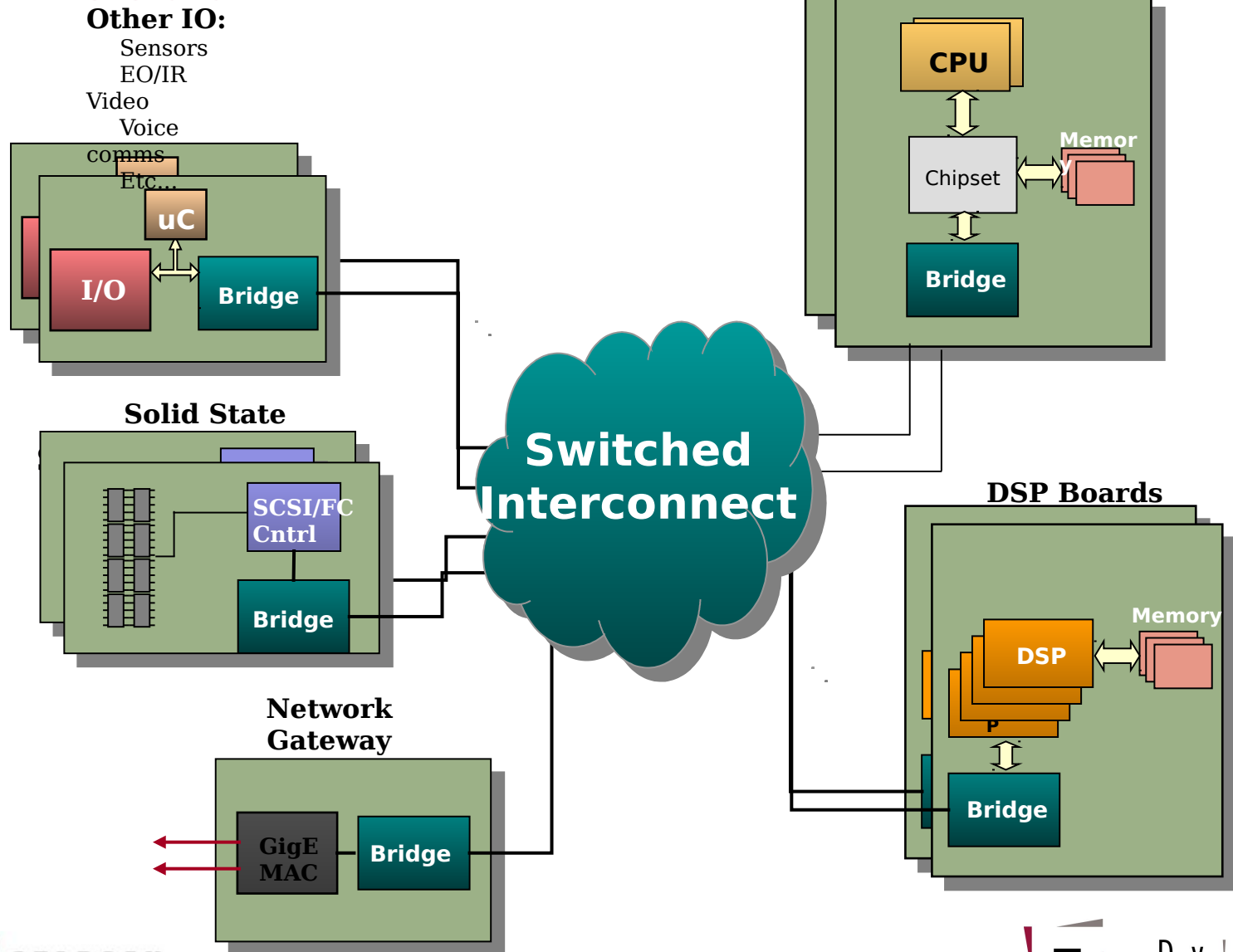
Parallel Bus
PCI or TDM or
Proprietary

StarFabric
Frames at 2.5G
Transmit and
2.5G Receive
Bridge

Redundant fabric
interconnect
accomplished with
a 2nd Switch
device

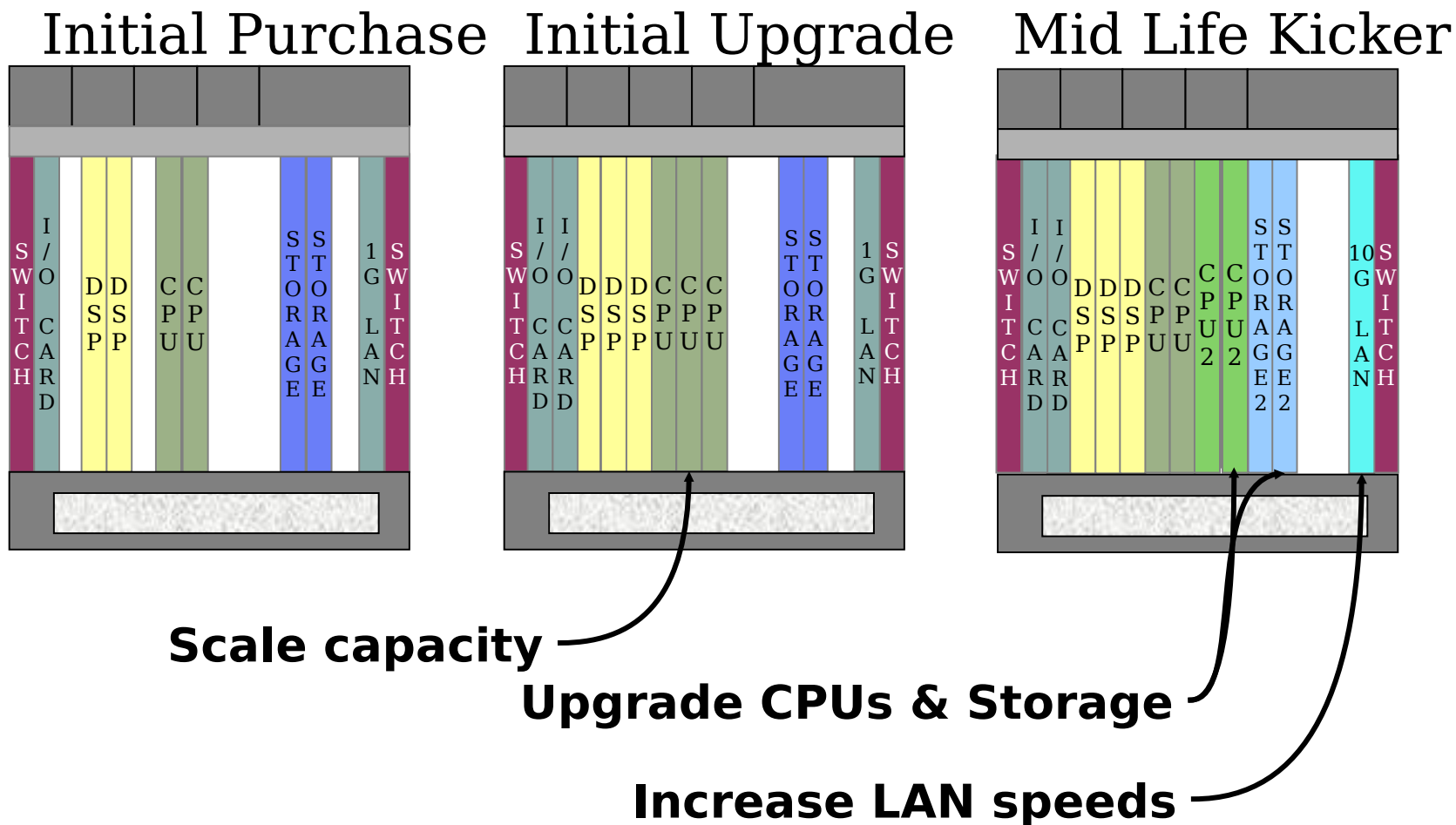


New Degrees of Architectural Freedom

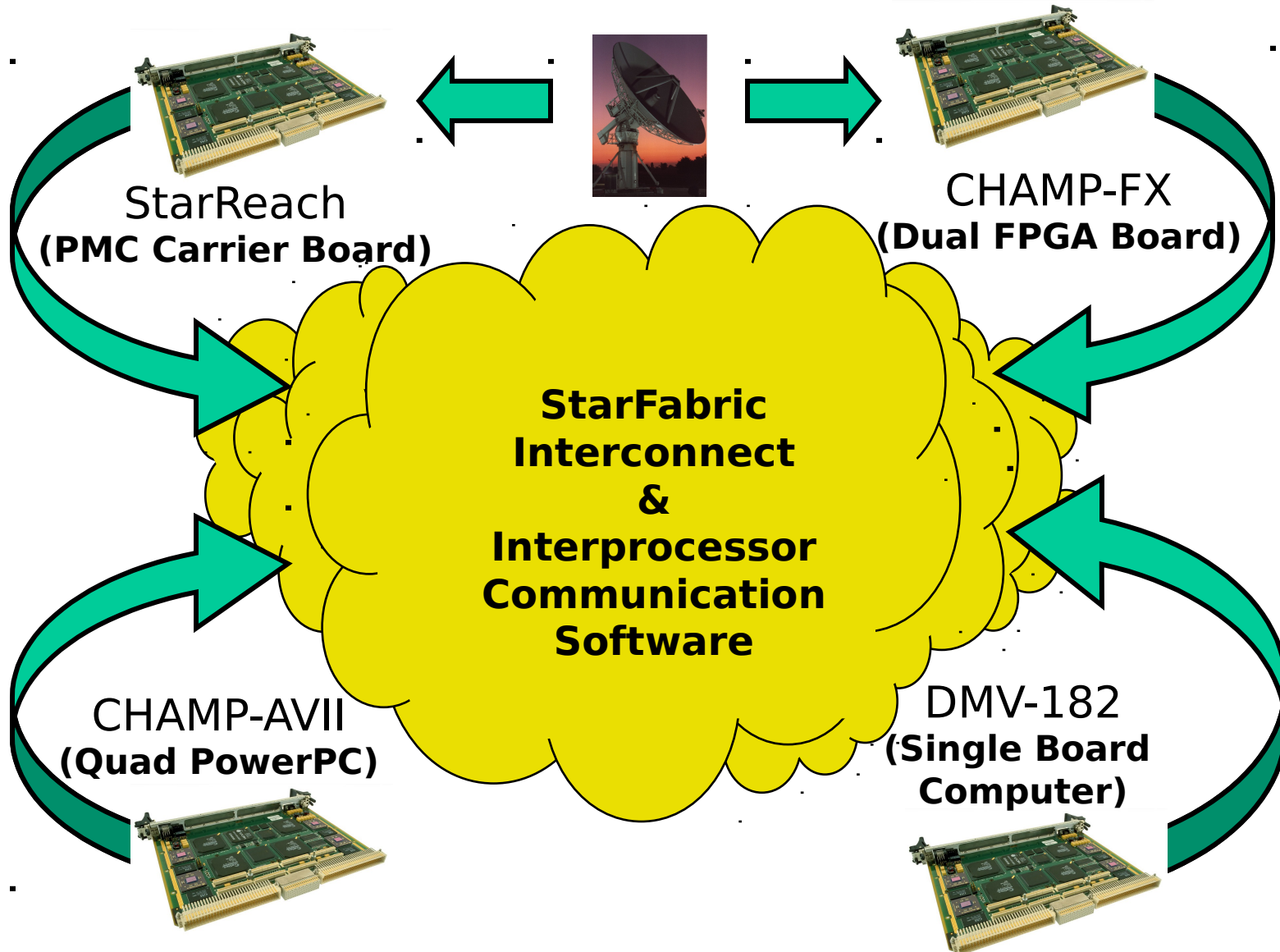


Adaptive Infrastructure

Life Cycle Benefits

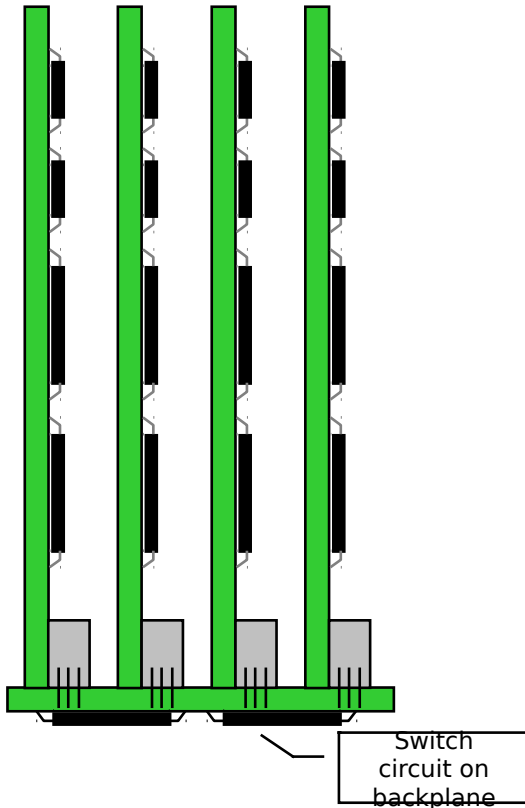


Dy 4 System Solutions



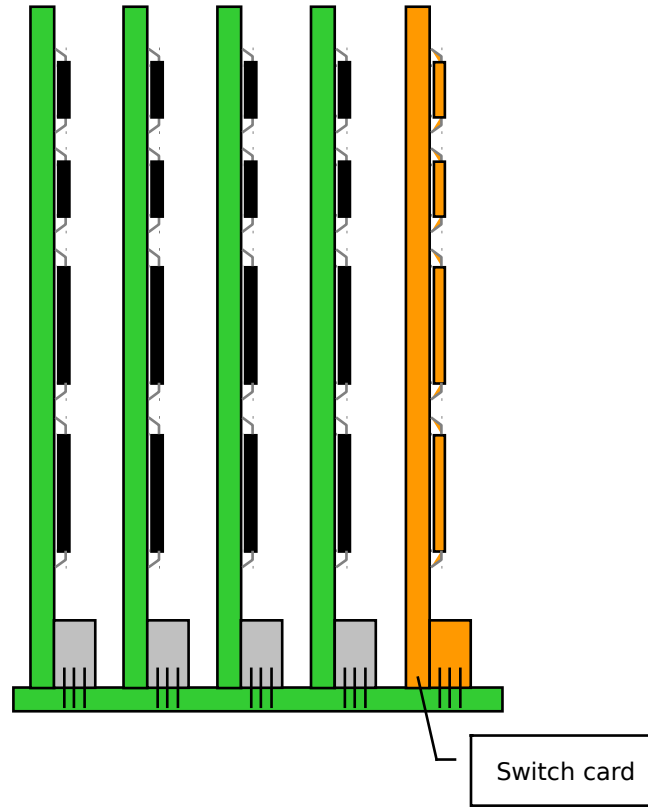
Advantages of Distributed Switching

Backplane switching



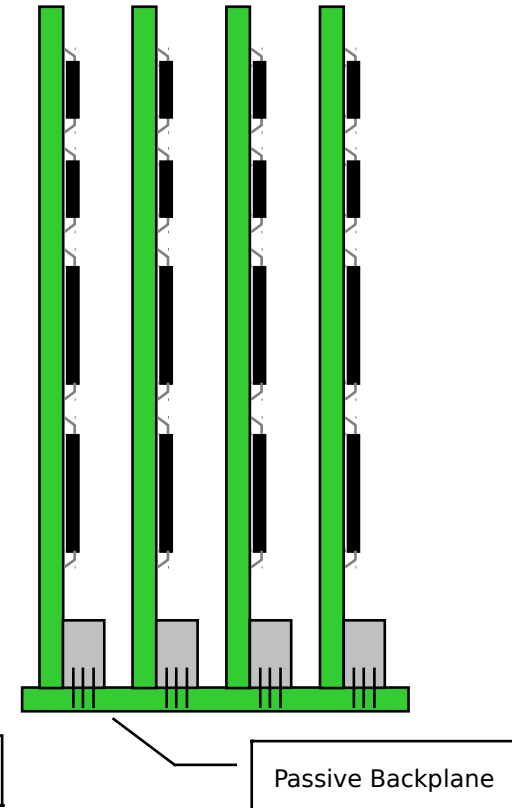
- ✓ Four slots
- ✗ Active circuits on backplane

Separate Switch Card



- ✗ Requires extra slot
- ✗ Single point of failure
- ✗ Extra LRU item logistics

StarFabric



- ✓ Switching on card
- ✓ No active backplane
- ✓ Four slots used

Summary

- **Switched Interconnects like StarFabric and PCI Express AS:**
 - Provide low cost, high performance interconnects for multislots, distributed architectures
 - Leverage the PCI/PCI-X infrastructure and volumes
 - Provide CPU-to-CPU and CPU-to-device communication
 - Reduces processor overhead and system latencies
 - Provides a reliable interconnect for multiple classes of service
 - Enables design flexibility and system disaggregation
 - Allows flexible fabric architecture, centralized or distributed switching

Thank You!

Contact information for follow up questions or discussions...

Emmanuel Eriksson
Technology Architect
Technology Innovation Group
Dy 4 Systems Inc.
emmanuel.eriksson@dy4.com
(613) 599-9199 x5462

or visit...

www.stargen.com
www.dy4.com

